B.N.BANDODKAR COLLEGE OF SCIENCE – THANE

F.Y.B.Sc First Semester End Examination October – 2011

Code- USMT101 –Additional Exam.

Duration – 2 Hrs **Max. Marks 60**

N.B. All questions are compulsory.

Q.1 **(a)** Solve : $| 8 – 3x | \le 7$. **(3)**

(b) **Attempt any three of the following.**

(i) Sketch the graph of $f(x) = x^2 +5x + 6$. **(4)**

(ii) Use $\in$ - δ definition to prove that $\lim_{x \to 1} 5x +3 = 8$. **(4)**

(iii) State and prove Sandwich theorem. **(4)**

(iv) Let G : IR → IR is defined as **(4)**

$G(x) = x$ if $x < -2$

$= bx^2$ if $x \ge -2$.

Find the value of b for which G is continuous.

(v) Prove that $\lim_{x \to \infty} \frac{1}{x} = 0$. **(4)**

Q.2 **(a)** Let f : IR → IR be defined by f(x) = sin x . Find derivative of f at x = a. **(3)**

(b) **Attempt any three of the following.**

(i) Find $\frac{dy}{dx}$ if $(3xy + 7)^2 = 6xy$. **(4)**

(ii) Prove that every differentiable function is continuous. **(4)**

(iii) Let f : IR → IR be defined by $f(x) = \sqrt{x}$, Find $\frac{d}{dx} f^{-1}(x)$. **(4)**

(iv) Find n th derivative of $f(x) = x^3e^{4x}$. **(4)**

(v) Let f : IR → IR be defined by f(x) = x tan (2x +7). Find derivative of f(x) using chain rule. **(4)**

Q.3 **(a)** Find $\lim_{x \to 0} \frac{x - \log(1+x)}{1 - \cos x}$. **(3)**

(b) Attempt **any three of the following.**

(i) Verify Rolle's theorem for $f(x) = x^2 + 8x + 15$, $x \in [- 5 , - 3]$. **(4)**

(ii) Prove that $f(x) = x^2 + 4x + 5$ is increasing. **(4)**

(iii) State and prove Lagrange's Mean Value Theorem. **(4)**

(iv) Find Taylor's expansion of f(x) = sin x. **(4)**

(v) Find local Maxima / Minima of $f(x) = 4x^3 – x^4$. **(4)**

Q.4 **(a)** Find n^{th} derivative of f(x) = log (3x + 4). **(3)**

(b) **Attempt any three of the following.**

(i) Sketch the graph of $f(x) = - 2x^3 +6x^2 – 3$. **(4)**

(ii) Prove that $f(x) = | x |$ is continuous for all values of $x \in$ IR. **(4)**

(iii) Define Ceiling and Flooring function. **(4)**

(iv) Prove that $| a | < b$ if and only if $- b < a < b$. **(4)**

(v) State and prove Cauchy's Mean value Theorem. **(4)**

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